AN OBSERVATIONAL STUDY OF LEKKING BY WHITE-COLLARED MANAKINS (*MANACUS CANDEI*)

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Abstract. (CDW) We conducted an observational study of the behavior of male white-collared manakins in a lek in a secondary forest at Estacíon Biologica La Selva, Costa Rica. We quantified the size and shape of the display courts in the lek and determined their positions by coordinates of the Geographic Information System (GIS). The courts were oval-shaped and arranged around display perches, minimizing the amount of clearing needed to maintain a suitable court.. We found the majority of the courts were within 10 m of the lek center, indicating that there may be advantages to these locations, such as increased mating success. This study could serve as a basis for further work on these birds and their behavior.

INTRODUCTION (CDW)

The white-collared manakin (*Manacus candei*) is a fascinating lek breeding bird that inhabits lowlands and foothills inland from the Caribbean between southeastern Mexico and northern Panama. They are relatively abundant in La Selva and easily located by the snapping noises they make to attract mates. They will display freely with observers <2 m away (pers. obs.) In spite of their suitability for study, little research has been done on them or their behavior, although several short-term studies have been done at several locations within Estacíon Biologica La Selva (Breitswisch 1982, Webster 1985, Etemad-Green and Green 1986, Uyehara 1990, Hughes 1991). Many of these compared the behavior of *M. candei* to that of related species, namely the white-bearded (*M. manacus*) and orange-collared (*M. aurantiacus*) manakins, although the exact relationship between these species and *M. candei* has not been carefully studied.

A lek is a group of males that congregate for the purpose of attracting females, but can also be defined as the location where they cluster for this purpose. In *M. candei*, leks consist of many display courts which are cleared areas on the ground, containing two to five small vertical saplings which are used as display platforms. The number of courts in a *M. candei* lek are believed to be much lower than that of *M. manacus* (ca. nine as opposed to ca. 70, pers. obs., Snow 1976). The leks for all these manakins occur in secondary forest with fairly dense underbrush.

The standard display behavior consists of jumping back and forth between saplings and the ground, making a snapping noise with their wings each time they jump. This "snap" is apparently generated by specialized feathers which hit each other when wings are "quickly opened and closed," (Breitswisch 1982) although it is unclear whether the primary (Sick 1967) or secondary (Breitswisch 1982, Stiles and Skutch 1989) feathers are involved.

Published estimates of the size and shape of the display arenas vary widely. Webster (1985) described them as circles 0.5-1.0 m in diameter, while others have said that they are "roundish areas...sometimes over 1.2 m across" (Stiles and Skutch 1989). Etemad-Green and Green (1986) used the formula of an ellipse to quantify the area of 12 courts in two leks. They also suggested that males make their courts by simply clearing debris from the area between potential display platforms. To invest the least possible energy in clearing a court between a given set of saplings, the area cleared should be oblong as opposed to a circle. To further minimize clearing costs, they should also not clear litter beyond their display platforms. Therefore saplings should be located near to the edge of the courts.

Mating success of males near the center of leks has been shown to be higher than that of peripheral males in other lekking birds, particularly *M. manacus* (Snow 1976). Etemad-Green and Green (1986) found clumping of courts around the center of one of the two leks they mapped out. We expected the majority of the display sites to be located close to the center of the lek.

Diurnal activity peaks have been reported at 1400 (Etemad-Green and Green 1986) as well as 0800-0900 (D. McDonald pers. comm.) We expected to see the highest display activity at these two times.

METHODS (WLO)

On 14-15 February 1995, we observed the display behavior of a white-collared manakin lek at Estacíon Biologica La Selva next to a plantation plot 50 m south of the Sendero El Atajo, 100 m from its junction with the Sendero Tres Ríos. We observed the flight patterns and looked for active display courts by looking and listening for displaying birds. Using a compass and a meter tape, we determined the locations of all courts with respect to the GIS location marker at 1600, -750. We calculated the center of the lek by averaging the North-South and East-West coordinates of all courts, and determined the distance of each court from that center point.

For each display court, we measured the length and width of the area which had been cleared of leaf litter or other debris. The relative area was calculated using the equation for the area of a rhombus (length x width/2). We recorded the position of saplings within the display area on which males were seen to display or which had signs of wear or scratchings up to 20 cm above ground. We visually measured the height of canopy cover and took a bearing along the long axis of the courts.

RESULTS AND DISCUSSION (WLO)

We plotted the positions of all of the display courts on a map of the area (Fig. 1). We also drew diagrams of all nine display courts (Fig 2). The center of the lek was located at (1616, -776), and coincided with the position of court H. The majority of courts (n=5) were ≤10 m from the center. The other four courts were between 15 and 27 m from the center of the lek (Table 1). This distribution suggests that it may be advantageous to display closer to the center as previous studies on other species have determined. If we had more time, we would have tested if each court was active by placing a leaf in the center as did Etemad-Green and Green (1986).

The courts were situated between 2-4 small saplings which the males jumped back and forth between. This created an elliptical court, with a significant difference between the length (1.21 ± 0.3 m) and width (0.65 ± 0.18 m) of each court ($T=5.73$, $df=8$, $P=0.0004$), as we predicted, supporting Etemad-Green and Green's idea (1986) of courts being cleared between saplings and not as a perfect circle (Fig. 2). All saplings were within 10 cm of the court perimeter indicating that the males were not clearing beyond their display platforms. Further study is necessary to determine if there is a correlation between the court area and the distance from the center of the lek.

All the courts were situated under a canopy of trees ranging between 0.5-5 m, but received a fair amount of light through sunspots.

On the morning of 14 February, displays were infrequent and sporadic (ca. 20 bouts of snapping in two hours of observation). During displays, they frequently vocalized, snapped their wings, and when perched we noticed that they puffed out their throats while calling. On 15 February, baseline activity appeared moderately higher, and in addition we observed bouts of heightened activity between 0830-0930 and 1400-1430.

Twice we also observed an unreported behavior by multiple birds. Groups of 4-5 males were all displaying frantically in the canopy of one tree or bush, flying from branch to branch snapping their wings and calling repeatedly. During the first such bout we believe we saw a female white-collared manakin, and we definitely saw one in the second such bout. This display behavior continued for approximately two minutes before the males descended to their individual courts and began actively

performing the standard display of jumping back and forth between saplings and snapping their wings. We believe that this was an attempt on each male's part to gain the attention of the female and lead her back to his display court. A potential future study could determine if this display behavior is in fact competition for female attention or an aggressive interaction to determine dominance among males.

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Table 1. Length, width, relative area (lw/2), nearest neighbor (NN), distance to nearest neighbor, location to the center, and GIS coordinate of nine manakin display courts in La Selva.

Court	Length (m)	Width (m)	area (m^2)	NN	Dist. to NN (m)	Dist. to center (m)	GIS coordinates
A	1.18	0.57	0.33	B	19	25	(1596, -761)
B	0.90	0.56	0.25	G	12	15	(1615, -761)
C	1.11	0.76	0.42	D	19	27	(1638, -793)
D	1.80	0.50	0.45	I	6	10	(1626, -774)
E	0.90	0.45	0.20	G	6	6	(1610, -776)
F	1.51	1.05	0.79	E	19	20	(1609, -795)
G	1.00	0.60	0.30	H	3	4	(1615, -773)
H	1.20	0.67	0.40	G	3	0	(1616, -776)
I	1.32	0.68	0.45	H	5	5	(1621, -778)

FIG. 1. Map of a white collared manakin lek at Estacîon Biologica La Selva .

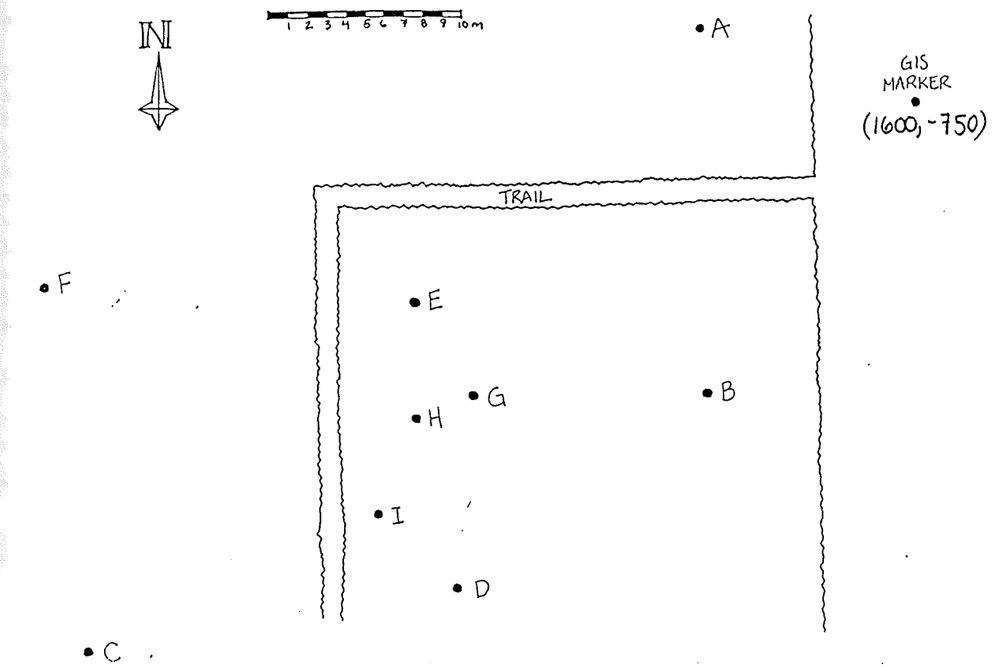
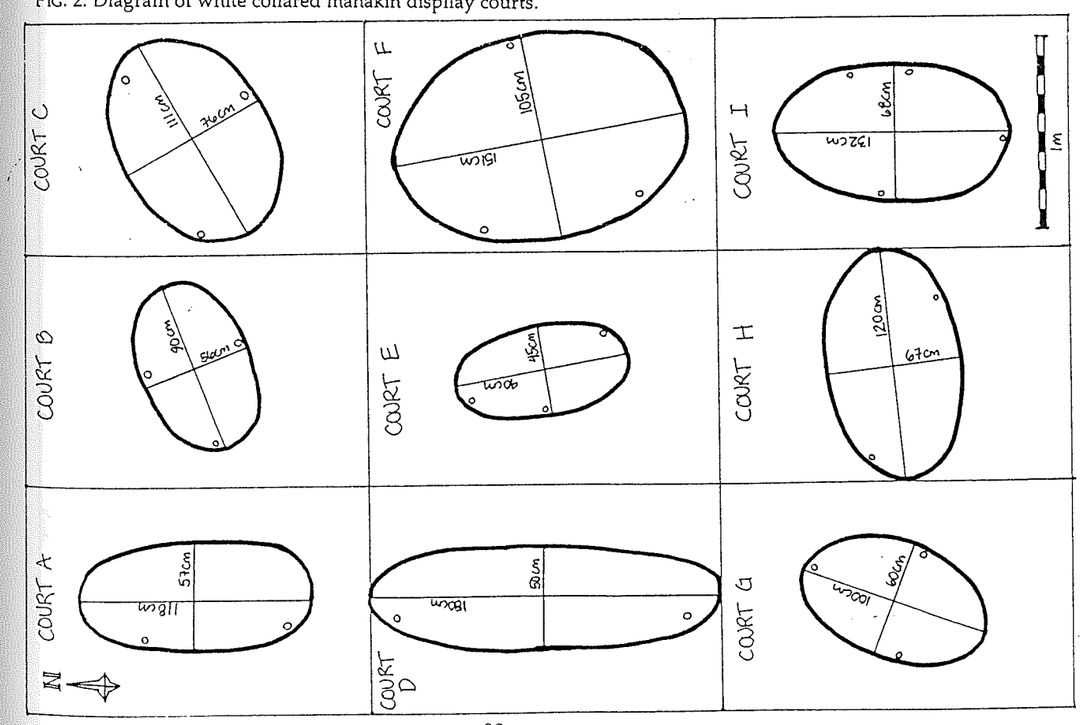
FIG. 2. Diagram of white collared manakin displlay courts.